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Small Trees Wasteful to Cut for Saw Timber

TREES IN SUCH A STAND OF WHITE PINE FORMED OF MIXED SIZES VARY WIDELY IN RELATIVE LOGGING COSTS. PROFITS MADE ON THE LARGE TREES CAN EASILY BE LOST BY CUTTING THE SMALLER ONES.

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Foreword

The Edgar Lumber Co. of Wesson, Ark., of which G. P. Gemmill is manager, had a problem of operating on small-sized short-leaf pine timber after the larger timber had been cut. It was found that their operation was not profitable. Mr. Gemmill stated in a paper printed in proceedings of the Southern Logging Association that he was greatly assisted in solving their problem by an article by W. W. Ashe on "The Economic Waste of Cutting Small Timber." He said:

> Since no two logging jobs are alike, all of the tables [1] given by Mr. Ashe on logging costs were tested in our woods and mill, a month being the period of time used in determining the average of logs cut, and we were forced to conclude that he was conservative in his figures.

[1] The tables to which Mr. Gemmill refers are, with slight changes, those given in this leaflet.

SMALL TREES WASTEFUL TO CUT FOR SAW TIMBER

By W. W. Ashe, *Senior District Forest Inspector, Forest Service*

What sized tree is the best to cut from the woods for saw timber? Clearly it must vary with the conditions and with the kinds of timber; but there are several fixed relationships between trees of large and small diameters that should be given careful consideration before cutting is begun.

It costs more than twice as much, in both time and labor, to manufacture 1 board foot of lumber from a tree 8 inches in diameter (4½ feet from the ground) as from a tree 25 inches in diameter. Less than one-half as much salable lumber is obtained from a cubic foot of wood in an 8-inch tree as from a cubic foot of wood in a 25-inch tree. Furthermore, the lumber obtained from an 8-inch tree has less than half as much value per 1,000 feet as that from a 25-inch tree.

This and other information about whole trees is obtained by studying the logs handled in a regular logging operation and combining figures for enough logs in each case to represent a tree. By timing the different steps in felling the trees and sawing them into logs, hauling the logs to a road, loading them on a wagon or truck, hauling them to the sawmill, and sawing them into lumber, it is found that for each successive step far more time is required to handle enough small logs to produce 1,000 board feet of lumber than to handle a sufficient number of large logs to produce the same quantity. Cutting small logs into lumber is wasteful of wood. Even if the logs are sawed by means of the economical band saw, or by the gang saw of northern Europe, the efficiency of which has just been tried in this country, 71 per cent of the wood of a log 5 inches in diameter goes to waste in sawdust and slabs; but only 38 per cent of a log 20 inches in diameter is lost. (Table 1.) For each board foot of lumber obtained from a 5-inch log 16 pounds of wood and bark must be handled; but for each board foot of lumber from a 20-inch log only 7½ pounds must be handled.

Table 1.—*Number of board feet cut from 1 cubic foot of wood in logs of different diameters, and proportion of wood not utilized for lumber*

Average diameter of logs at small end	Number of board feet to each cubic foot of wood (band saw)	Proportion of wood not utilized for lumber	Weight of wood (with bark) to each board foot of lumber
Inches	*Board feet*	*Per cent*	*Pounds*
5	3.5	71	16.0
8	5.2	54	11.0
10	6.0	48	9.6
12	6.5	44	8.9
14	6.9	41	8.3
16	7.1	40	8.0
18	7.3	39	7.7
20	7.4	38	7.5
25	7.5	37	7.4

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To find out how much time is required to handle different sized logs from the stump through the sawmill, logging crews were followed all day and each step in the operation was accurately timed. The figures for logs were then combined in such a way as to give the time required for handling whole trees of different sizes. In Table 2 is given the time required for each step in converting trees of different sizes into lumber.

TABLE 2.—*Time, per 1,000 feet of lumber, required to log and saw into lumber trees of different diameters*

Diameter of trees (outside of bark) 4.5 feet above ground	Time required for—				
	Felling and sawing into logs	Skidding and bunching	Loading and hauling to mill	Handling and sawing into lumber	All activities
Inches	*Minutes*	*Minutes*	*Minutes*	*Minutes*	*Minutes*
8	345	143	411	312	1,211
10	290	94	380	248	1,012
15	202	54	315	143	714
20	151	48	280	112	591
25	109	43	255	102	509

Practically twice as much time is required to produce lumber from trees 10 inches in diameter as from trees 25 inches in diameter. It is not material whether the sawyers in felling trees work fast or slow; the relation between the time required for small trees and the time required for large trees remains the same. Likewise in skidding it does not matter whether the team is a good team or a poor team; the relative skidding time remains essentially the same until a point is reached at which the team is overloaded. Nor does it matter whether, in hauling, all logs from small trees and all logs from large trees are hauled separately or mixed. If 10-inch trees are cut, 44 logs must be handled in order to obtain 1,000 feet of lumber; if 25-inch trees are cut, only 4.7 logs must be handled in order to secure 1,000 feet of lumber. (Table 3.)

TABLE 3.—*Number of logs from trees of different diameters and the number of trees of different diameters required to produce 1,000 board feet of lumber; and the mill value of lumber per 1,000 feet produced from southern yellow pine trees of different diameters*

Diameter of trees (outside of bark) 4.5 feet above ground	Logs to produce 1,000 feet of lumber	Trees to produce 1,000 feet of lumber	Value of lumber per 1,000 board feet (southern) yellow pine
Inches	*Number*	*Number*	*Dollars*
8	53.0	30.0	16.80
10	44.0	15.0	18.60
15	15.0	4.5	27.50
20	7.5	1.7	33.20
25	4.7	1.1	35.00

The skid trails on which the figures for skidding time in Table 2 are based consisted of two or more logs fastened end to end by hooks and chains. They were made up of logs from different trees. Had all

logs from trees of the same diameters been grouped into separate trails the relative difference in skidding time between large and small trees would have been much greater.

The relative time of loading on wagons or trucks was determined without reference to the method used. Some methods of loading are more efficient than others, but it is essentially immaterial whether the logs are loaded by means of teams and rope and rolled up skids or by the most efficient type of steam loader. In either case far more time is required to load 1,000 board feet in small logs than in the larger logs. In using a team, the logs are handled singly and there is but

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FIGURE 1.—It is not material whether trees when logged are moved by wagon or by truck, by high wheel or by low wheel, skidded on the ground or by overhead wire—it costs far more per thousand feet of lumber produced to handle the logs from the small trees than from the large trees

little difference in relative time until logs are handled which are so large as to overtax the capacity of the team. (Fig. 1.)

For hauling, the timing was based on truck or wagon loads of logs from small trees mixed with logs from larger trees. Careful inspection, however, shows that it is essentially immaterial so far as truck or wagon or car capacity in concerned whether all logs from small trees and all logs from larger trees are hauled separately or whether they are mixed. Only in exceptional cases are there too few small logs from the upper part of the stems of large trees to fill in or round out a load. Consequently small logs from small trees, if numerous, merely replace certain logs cut from larger trees and reduce the loading capacity of the truck or wagon to that extent. Likewise the investigation of hauling showed that the truck capacity

when loaded with 8-inch trees is only about half what it is when loaded with 25-inch trees, and consequently it will require about twice as long to haul the logs from the 8-inch trees as those from the 25-inch trees, and the relative hauling time of the intermediate

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FIGURE 2.—An opportunity for display of judgment in cutting hardwoods so as to keep logging costs low and secure high grades of lumber

sizes will be proportional—actual hauling time in any case will, of course, vary with the distance, character of the roads, etc.

The relative time required for all logging and milling operations is summed up in the last column of Table 2. To produce 1,000

board feet of lumber from trees 10 inches in diameter, including the work by sawyers, skidding time, hauling, and the work by sawmill men, 1,012 minutes are required; 714 minutes are required with 15-inch trees; but only 509 minutes are required with 25-inch trees. The actual costs in money will be in approximately the same relation. It is immaterial where the timber is located; the kind of timber does not change the relationship; the cost of wages does not affect it; some circular sawmills have a larger capacity than others, but the relative cost of handling is not greatly changed.

To get the relative cost in any particular locality the current local cost or rate of pay per hour can be computed and substituted for the figures for time in Table 2. Wages and the rental or use value of a team, and the number of hours per day of work may vary in different places, but these costs can all be reduced to an hour cost basis for any part of the United States.

If the timber is sold in the form either of boards or of logs for sawmill use, the landowner sustains a loss in cutting the small trees because of the lower grades of lumber or the narrow widths and small sizes obtained. (Fig. 2.) For very knotty lumber, narrow widths, and small sizes of framing as well as of finishing lumber, the selling price is lower than for lumber with fewer knots or of larger dimensions. Table 3 shows that in cutting southern yellow pine the value per 1,000 board feet of the lumber produced from trees 25 inches in diameter is more than twice that for the same amount of lumber sawed from trees 8 inches in diameter. Though the figures given are for southern yellow pine, the same principle applies to yellow poplar, to the oaks, to northern white pine, and to the pines and firs of the Western States. The form and size in which such wood is marketed largely determine its value.

The soil is capable of producing only a definite number of cubic feet of solid wood each year. This material may be cut in the wasteful form of 8-inch trees or it may be cut in the form of the larger and more economical trees. Cutting small trees for saw timber actually has the result of lowering the capacity of the soil to produce high-class material.

The farmer, as a rule, is in an excellent position to take advantage of all of those factors which increase the earning value of his woodland. He can do his own logging or can closely supervise it. Unlike large mill operators, who frequently cite the necessity for realizing on a large investment as the motive inducing them to cut "clean," taking small as well as large trees, the farmer has no great investment in railroads, in locomotives, or in a large and costly mill the construction costs of which must be paid for out of the timber cut. The farmer can sell or cut a small amount of the largest or highest grade trees at frequent intervals and thus obtain—

A low logging cost.

A high quality of logs, selling at the best price or producing a high grade of lumber.

A high producing capacity for his soil.

Frequent and regular returns, or a reserve of large timber to hold until a need or an emergency makes it desirable to convert it into cash.

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